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10/618,791	07/14/2003	Thorsten Pannek	10191/3085	7312
26646	7590	04/06/2005	EXAMINER	
KENYON & KENYON ONE BROADWAY NEW YORK, NY 10004			BRUENJES, CHRISTOPHER P	
			ART UNIT	PAPER NUMBER
			1772	

DATE MAILED: 04/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/618,791

Applicant(s)

PANNEK ET AL.

Examiner

Christopher P Bruenjes

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 January 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-19 is/are pending in the application.
- 4a) Of the above claim(s) 10-19 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 July 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

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DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group I, claim 1-9 in the reply filed on January 10, 2005 is acknowledged.

2. Claims 10-19 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on January 10, 2005.

Drawings

3. The drawings are objected to because:

Regarding Figure 2, the figure is described in the specification to show the layer structure illustrated in Figure 1 after removal of the sacrificial layer, however Figure 2 appears to be exactly the same as Figure one which is prior to removal of the sacrificial layer. Regarding Figure 3, the arrow from reference number 22 should be in contact with the 2nd sacrificial layer and instead appears to be pointing at one of the movable elements, the arrow should be redrawn for clarification. Regarding Figure 4, the arrow from reference

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number 25 should be in contact with the sealant layer and instead appears to be pointing at the membrane layer that is already labeled reference number 23, the arrow should be redrawn for clarification.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 1, the limitation "is not substantially attacked by the removing of the at least one first sacrificial layer" renders the claim vague and indefinite. It is not understood what is considered "substantially", is the first insulation layer being attacked or not. Furthermore, it is not understood how the first insulation layer is "attacked by" removing the first sacrificial layer, is the first sacrificial layer adhered to the first insulation layer and might pull the first insulation layer up with it, or is the attacking referring to the fact that the first insulation layer is not degraded by the same method the first sacrificial layer is removed. For examining purposes it is determined that the limitation requires that the method used to remove the first sacrificial layer does

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not fully damage the first insulation layer, but could partially damage.

Regarding claim 2, it is not understood in light of the specification if the limitation "situated between" refers to a stack of layers in which the electroconductive layer sandwiched between the at least one electrically non-conductive first insulation layer and the at least one first sacrificial layer or as described in the drawings that the electroconductive layer is in the middle of the layer that is made up of both a first sacrificial layer and first insulation layer. For purposes of examination the claim is determined to define the position of the electroconductive layer as within the layer of first sacrificial and insulation layer, as shown in the drawings.

Regarding claim 8, "the silicon dioxide" in line 3 lacks antecedent basis. To have antecedent basis both with the rest of claim 8 and the specification, "the silicon dioxide" should be changed to "the silicon oxide".

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-2 and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by Reichenbach et al (WO 01/46066 A2). US 2004/0065932 A1 is used as the English equivalent for WO 01/46066 A2 for purposes of citing within this rejection.

Reichenbach et al anticipate a component comprising a functional layer (reference number 16, Figure 11). A surface micromechanical structure is produced in the functional layer including movable elements (reference number 26, Figure 5) and immovable elements (represented by the other parts of the functional layer 16). The component further comprises at least one electrically non-conductive first insulation layer (reference number 12, Figure 7 outside the void area) and at least one first sacrificial layer (reference number 30, Figure 7) and a substrate (reference number 10, Figure 7). The substrate is connected to the functional layer via the first insulation layer and first sacrificial layer (Figure 7). The movable elements are exposed by removing the at least one first sacrificial layer (Figure 10). The at least one electrically non-conductive first insulation layer includes a material that is not substantially attacked by removing of the at least one first sacrificial layer (page 3, paragraphs 43 and 44).

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Regarding claim 2, an electroconductive layer (reference number 14, Figure 3) is structured and is situated within the layer formed of the first insulation layer and first sacrificial layer. In light of the specification and drawings "situated between" is determined to define positioning the layer within the layer comprising a first insulation and first sacrificial layer because that is where the electroconductive layer is positioned in all of the embodiments of the figures and descriptions within the specification. Regarding claim 5, the limitation "the at least one first sacrificial layer is removed at least in areas of the immovable elements" is determined in light of the specification and drawings to be defining an intermediate step. Therefore, the limitation within the article claim presented is determined to define the component as having no sacrificial layer between the immovable elements and any layer that would have been below the sacrificial layer had one been present. In this case, Reichenbach et al teach that the immovable elements are in contact with the first insulation layer and not the first sacrificial layer.

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
 2. Ascertaining the differences between the prior art and the claims at issue.
 3. Resolving the level of ordinary skill in the pertinent art.
 4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
6. Claims 3-4 and 6-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Reichenbach et al (WO 01/46066 A2) in view of Laermer (WO 02/38492 A1). US 2004/0065932 A1 is used as the English equivalent for WO 01/46066 A2 for purposes of citing within this rejection. US 2004/0112937 A1 is used as the English equivalent for WO 02/38492 A1 for purposes of citing within this rejection.

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Reichenbach et al teach all that is claimed in claim 1 as shown above. Reichenbach et al further teach at least one second sacrificial layer (the part of reference number 30, Figure 7 that is above the movable elements). The component also comprises at least one second insulation layer (reference number 34, Figure 11). The movable elements are exposed by removing the at least one second sacrificial layer (Figure 11). The at least one second insulation layer includes a material that is not substantially attacked by the removing of the at least one second sacrificial layer because the sacrificial layer is made of silicon oxide and the second insulation layer is made of silicon nitride and because the second insulation layer is applied after removing the second sacrificial layer. The at least one electrically non-conductive first insulation layer and the at least one second insulation are in contact and therefore are located only in areas of the immovable elements (Figure 11). The limitation "the at least one second sacrificial layer is removed at least in areas of the immovable elements" is determined in light of the specification and drawings to be defining an intermediate step. Therefore, the limitation within the article claim presented is determined to define the component as having no sacrificial layer between the immovable elements and any layer that would have been above the

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sacrificial layer, such as the second insulation layer, had one been present. In this case, Reichenbach et al teach that the immovable elements are in contact with the second insulation layer and not the second sacrificial layer. At least one of the immovable elements includes at least one electrode (Figure 34).

Reichenbach et al fail to teach forming a membrane layer over the surface micromechanical structure. However, Laermer teach that when covering micromechanical structures with insulating materials such as the silicon nitride of Reichenbach or the Pyrex glass of Laermer it is advantageous if the side of the glass or insulating material facing away from the microstructure have an electrically conductive layer or membrane, since then, the electrical voltage applied during bonding is distributed homogeneously over the entire surface of the glass element. Further, this layer permits electrostatic holding of the silicon wafer in a plasma etching system, during later backside structuring processes of the silicon layer, from which each respective microstructure is preferably patterned out (page 2, paragraph 12). One of ordinary skill in the art would have recognized that an electrically conductive layer or membrane layer is coated over the side of the insulating layer applied as a hermetic seal for a micromechanical structure, in order to provide the component with a homogeneous distribution

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of electrical voltage and an electrostatic holding layer for backside structuring processes of the silicon substrate layer, as taught by Laermer.

Therefore, it would have been obvious to one having ordinary skill in the art at the time Applicant's invention was made to arrange an electrically conductive membrane layer over the second insulation layer and second sacrificial layer of Reichenbach et al over the surface micromechanical structure of Reichenbach et al, in order to provide the component with a homogeneous distribution of electrical voltage and an electrostatic holding layer for backside structuring processes of the silicon substrate layer, as taught by Laermer.

Note that because the membrane layer of Laermer and Reichenbach et al combined is only connected to the second insulation layer and the second insulation layer is mechanically connected to the substrate via at least one of the immovable elements, then the membrane layer is at least indirectly mechanically connected to the substrate via at least one of the immovable elements.

7. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Reichenbach et al (WO 01/46066 A2) in view of

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Laermer (WO 02/38492 A1) as applied to claim 3 above, and further in view of Zavracky et al (USPN 5,490,034).

Reichenbach et al and Laermer combined teach all that is claimed in claim 3 as shown above. Reichenbach et al further teach that the first and second sacrificial layers are formed of silicon oxide removed by HF etching medium (page 3, paragraph 44) and that the second insulation layer is formed of silicon nitride (page 4, paragraph 49).

Reichenbach et al and Laermer combined fail to teach the first insulation layer is formed of silicon nitride. Reichenbach et al teaches that the first insulation layer should be an insulating material that will not be removed by HF etching as quickly as silicon oxide, but fails to provide examples of a material that would accomplish these requirements. However, Zavracky et al, which also deals with forming micromechanical structures for microsensors, teaches that silicon nitride is a well known material that is not attacked by HF etching as quickly as silicon oxide during removal of the silicon oxide sacrificial layer (col.4, 1.57-63 and Figures 2E and 2F). One of ordinary skill in the art would have recognized that silicon nitride is a well known insulator used in forming micromechanical structures for sensors, that is not attacked by HF etching as quickly as silicon oxide and would be used as an

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insulator that is not a sacrificial layer in a micromechanical structure, as taught by Zavracky et al.

Therefore, it would have been obvious to one having ordinary skill in the art at the time Applicant's invention was made to use silicon nitride as the first insulator of Reichenbach et al because silicon nitride is a well known useful insulator in the art of micromechanical structures used to form sensors and is not attacked by HF etching as quickly as silicon oxide and therefore would not be removed during the removal of the sacrificial layer, as taught by Zavracky et al.

8. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Reichenbach et al (WO 01/46066 A2) in view of Laermer (WO 02/38492 A1) as applied to claim 3 above, and further in view of Zavracky et al (USPN 5,490,034) and in view of Chatterjee et al.

Reichenbach et al and Laermer combined teach all that is claimed in claim 3 as shown above. Reichenbach et al further teach that the first and second sacrificial layers are formed of silicon oxide removed by HF etching medium (page 3, paragraph 44) and that the second insulation layer is formed of silicon nitride (page 4, paragraph 49).

Reichenbach et al and Laermer combined fail to teach the first insulation layer is formed of silicon nitride. Reichenbach et al teaches that the first insulation layer should be an insulating material that will not be removed by HF etching as quickly as silicon oxide, but fails to provide examples of a material that would accomplish these requirements. However, Zavracky et al, which also deals with forming micromechanical structures for microsensors, teaches that silicon nitride is a well known material that is not attacked by HF etching as quickly as silicon oxide during removal of the silicon oxide sacrificial layer (col.4, 1.57-63 and Figures 2E and 2F). One of ordinary skill in the art would have recognized that silicon nitride is a well known insulator used in forming micromechanical structures for sensors, that is not attacked by HF etching as quickly as silicon oxide and would be used as an insulator that is not a sacrificial layer in a micromechanical structure, as taught by Zavracky et al.

Therefore, it would have been obvious to one having ordinary skill in the art at the time Applicant's invention was made to use silicon nitride as the first insulator of Reichenbach et al because silicon nitride is a well known useful insulator in the art of micromechanical structures used to form sensors and is not attacked by HF etching as quickly as silicon

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oxide and therefore would not be removed during the removal of the sacrificial layer, as taught by Zavracky et al.

Reichenbach et al, Laermer, and Zavracky et al taken as a whole fail to teach that the silicon nitride forming the first and second insulation layers has silicon content greater than 42%. However, Chatterjee et al teach that a higher silicon content in silicon nitride, such as greater than 46%, helps to achieve a relatively low etch rate in comparison to silicon oxide when using an HF-based etching process (col.4, 1.56-61). Based on the teachings of Reichenbach et al and Zavracky et al, one of ordinary skill in the art would have recognized that any manipulation of silicon nitride that result in achieving lower etch rates with regards to silicon oxide in an HF-based etching process would be advantageous.

Therefore, it would have been obvious to one having ordinary skill in the art at the time Applicant's invention was made to form the silicon nitride used as the first and second insulation layer of the component of Reichenbach et al, Laermer, and Zavracky et al with silicon content greater than 42%, in order to achieve a lower etch rate in comparison to silicon oxide when using an HF-based etching process, as taught by Chatterjee, which is an useful advantage for the silicon nitride

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to possess as suggested by the teachings of Reichenbach et al and Zavracky et al.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Fischer et al (US 2003/0141561 A1); Fischer et al (US 2003/0001221 A1); Honer (USPN 6,822,304); Hierold (USPN 5,830,372); Noworolski et al (USPN 6,317,342); Rodgers et al (USPN 6,824,278); Galvin et al (USPN 6,199,874).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher P Bruenjes whose telephone number is 571-272-1489. The examiner can normally be reached on Monday thru Friday from 8:00am-4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Pyon can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Christopher P Bruenjes
Examiner
Art Unit 1772
CPB
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April 1, 2005

[Signature]
HAROLD PYON
SUPERVISORY PATENT EXAMINER
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4/4/05